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Koszut et al. 2021, Superhydrophobic Heat Exchangers Delay Frost Formation and Reduce Defrost Energy Input of Aircraft Environmental Control Systems (SSRN Electronic Journal). Kellermann et al. 2021, Design of a Battery Cooling System for Hybrid Electric Aircraft. van Heerden et al. 2022, Aircraft thermal management: Practices, technology, system architectures, future challenges, and opportunities (Progress in Aerospace Sciences, Vol. 128, Issue.). Koszut et al. 2022, Superhydrophobic heat exchangers delay frost formation and reduce defrost energy input of aircraft environmental control systems (International Journal of Heat and Mass Transfer, Vol. 189, Issue.). Durgam et al. 2022, Selection of aircraft materials and aircraft air conditioning technologies: A review (IOP Conference Series: Materials Science and Engineering, Vol. 1258, Issue.). Zheng et al. 2022, An Available-to-Implement Thermal Facility for Dynamic Bleed Air Test of Aircraft Environmental Control System (Aerospace, Vol. 9, Issue.). Kellermann et al. 2022, Design of a Battery Cooling System for Hybrid Electric Aircraft (Journal of Propulsion and Power, Vol. 38, Issue.). Duan et al. 2022, Multi-objective optimization of the aircraft environment control system based on component-level parameter decomposition (Energy, Vol. 245, Issue.). Saraçyakupoğlu 2022, Materials, Structures and Manufacturing for Aircraft. Sun et al. 2023, A pressure-node based dynamic model for simulation and control of aircraft air-conditioning systems (Energy, Vol. 263, Issue.). Chen et al. 2023, The Potential of Using Vortex Tube to Ameliorate Aircraft Environmental Control System (AIAA Journal, Vol. 61, Issue.). Coutinho et al. 2023, A review on the recent developments in thermal management systems for hybrid-electric aircraft (Applied Thermal Engineering, Vol. 227, Issue.). He et al. 2023, Energy-efficiency-oriented optimal control of aircraft environmental control system based on machine learning. A comprehensive review is conducted on advanced aeronautical air conditioning systems, focusing on various configurations and their impact on environmental control systems. Key studies from esteemed journals like Applied Thermal Engineering, Progress in Aerospace Sciences, International Journal of Refrigeration, The Aeronautical Journal, and Applied Sciences are analyzed to provide an overview of the state-of-the-art. The review highlights recent advancements in high-speed transport and thermal management challenges in hybrid-electric propulsion aircraft. It also delves into environmental parameters monitoring systems for power generation estimation from renewable energy systems and the importance of odor-sensitive passenger comfort in small aircraft cabins. Furthermore, the study examines integrated power and thermal management systems for civil aircraft, discussing their review, challenges, and future opportunities. A focus on air conditioning systems for aeronautical applications is also provided, including descriptions of standard vapor compression cycles and various types of air cycles (simple-cycle, bootstrap-cycle, 3-wheel, and condensing cycle). The analysis also touches upon water separation and air recirculation systems, highlighting their relevance in the context of environmental control systems. A new air cycle system based on vortex tubes and a parameter-matching method is proposed, offering potential improvements over traditional designs. In conclusion, this review aims to provide a thorough understanding of current research and development trends in aeronautical air conditioning systems, with implications for thermal management and passenger comfort in civil aircraft. The development of an air cycle refrigeration system for aircraft cabin cooling was prompted by concerns over climate change. A numerical study simulated a small aircraft cabin as an experimental facility to evaluate passenger comfort in the presence of high volatile organic compound (VOC) concentrations, finding that the model is insensitive to inlet air mass flow variations. Air cycle refrigeration offers a viable alternative for providing aircraft cabin cooling, with the primary function of the cabin air conditioning and pressurization system being to maintain conditions suitable for equipment operation and occupant comfort. This chapter covers existing systems in use. A thermodynamic study focused on an air cycle machine (ACM) for aircraft air-conditioning purposes, featuring two compact heat exchangers, a compressor, and an... The rapid increase in liquid cooling demand from high-power avionics in military aircraft has posed a challenge for designers. A number of state-of-the-art... The three-wheel LPWS requires less ram air mass flow and lower expansion ratios than the HPWS, with advantages including lower weight, cost, and higher reliability. This configuration is suitable for specific aircraft. A review presented the latest progress in air cycle environmental control systems (ECS) for commercial aircraft, encompassing pressurized air sources of cabin fresh... The engineering aspects of a modern commercial jet airliner ECS were discussed, focusing on cabin air quality. National news media coverage suggests that... Engineering considerations were examined to provide cooling, heating, ventilation, humidity/contaminant control, and pressurization within aircraft occupied compartments, cargo compartments, and electronic equipment bays...